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Goodson et al. already teaches increasing channel density at col. 15, lines 1-5. Given that Goodson et al. already teaches one scheme for increasing channel density, why would one of ordinary skill in the art have been motivated to look elsewhere (and specifically to Chrysler et al.) to add the specific teachings in the secondary reference? This is the central question of desirability that the Examiner has not answered nor shown.

To forestall the inevitable argument, it is circular logic to point to the teachings of the secondary reference, Chrysler et al., to provide motivation for adding itself to Goodson et al. The suggestion or motivation must be found in the primary reference, Goodson et al., or in knowledge available to one of ordinary skill in the art. Neither having been shown, a *prima facie* case of obviousness has not been established for claims 1-13, 15, and 27-31, and the rejection thereof should be withdrawn.

II. Teaching away:

Moreover, Chrysler et al.'s exclusive teaching that the fin assembly in Fig. 5 may be used with thermal conduction modules (TCMs) teaches away from the combination. See M.P.E.P. § 2145(X)(D) ("proposed modification cannot render the prior art unsatisfactory for its intended purpose or change the principle of operation of a reference"). Chrysler et al. discloses that these TCMs include a chip carrier on which "[a] hundred or so chips are mounted" (col. 1, lines 31-38). The proposed combination of fin structures intended for cooling chip carriers containing hundreds of chips to the device 50 of Goodson et al. would change the intended purpose or principle of operation of Goodson et al., Chrysler et al., or both.

A. Examiner's response:

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The Examiner first alleges on page 3 of the Final Office Action that Chrysler et al. “is pertinent as analogous art because it discloses the problem that the applicant is concerned with.” The Examiner also alleges that the proposed modification to Goodson et al. “does not in any way prevent Goodson et al. from cooling the circuitry.”

B. Applicants' reply:

As to the first contention, it is clear factual error to say that Chrysler et al. “discloses the problem that the applicant is concerned with.” First, the Examiner does not enumerate on page 3 of the Office Action exactly what this problem is. Assuming, however, that the problem is as stated on page 2, line 7, of the Final Office Action: “cooling of circuitry,” this statement is still clear factual error.

Applicants are sure that given a sufficient level of generalization (e.g., “cooling” or “heat transfer” or “thermodynamics” generally), the Examiner could accurately state that the problems faced are the same. In fact, Applicants are concerned with liquid coolant circulating in channels in the vicinity of an integrated circuit (see paragraphs 2 and 3 of the Background, and the rest of Applicant's Detailed Description). Chrysler et al., by contrast, was invented 20 years ago and concerns the “macro” problem of cooling TCMs, each including a chip carrier on which “[a] hundred or so chips are mounted” (col. 1, lines 31-38). Thus, it is clear factual error to state that Chrysler et al. concerns the same problem within the general electronics cooling arts.

As to the second contention, it assumes the result intended. The Examiner cannot confidently say that incorporating a macro (i.e., large scale) fins intended for cooling modules containing hundreds of chips into an integrated, on-chip, closed channel cooling environment

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would not alter the principle of operation of Goodson et al. In any event, the macro, board-level teaching of Chrysler et al. is not analogous to, and teaches away from, the integrated, on-chip level teaching of Goodson et al. To argue otherwise in defense of a hindsight-informed combination of two patents of such disparate ages and teachings is clear legal and factual error.

Because no motivation to combine the references has been shown, a *prima facie* case of obviousness has not been established for claims 1-13, 15, and 27-31, and the rejection thereof should be withdrawn.

Regarding claims 14 and 16-18, the proposed modification of Tuckerman et al. (claim 14) or the addition of Crowe (claims 16-18), even if such were proper, fail to cure the evidentiary deficiencies noted above. In view of the above, a *prima facie* case of obviousness has not been established for claims 14 and 16-18, and the § 103(a) rejections thereof should be withdrawn.

Claims 19-22:

Applicants respectfully traverse the 35 U.S.C. § 103(a) rejection of claims 19-22 over Goodson et al. in view of Chrysler et al. and further in view of Tuckerman et al. As explained above, a *prima facie* case of obviousness has not been established, because no evidence has been provided that one of ordinary skill would have been motivated to add the teachings of Chrysler et al. to Goodson et al. The same two traversals above apply equally here.

I. No Suggestion or Motivation:

Further, no evidence has been provided for the proposed addition of Tuckerman et al. Only a bare conclusion of “to improve the reliability of the system and reduce component count”

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has been alleged, which is legally insufficient to establish a *prima facie* case. See M.P.E.P. § 2143.01. No evidence has been provided that, for example, putting the cooling channels in a surface of a chip would improve reliability. It would not reduce component count, to the extent that heat exchanger 200 in Goodson et al. is part of the same “component” as device 50 after they are fabricated.

A. Examiner’s response:

The Examiner first responds on page 4 of the Final Office Action with a general teaching from Lee (newly cited U.S. Patent No. 6,698,502) that heat reduces reliability. The Examiner also repeats the allegation, without further elaboration, that integrating the microchannels within the device “reduces component count.”

B. Applicants’ reply:

First, a general teaching from Lee that heat is bad (e.g., Lee continues in subsequent paragraphs that fans, liquid cooling, and heat pipes are better) does not answer the traversal that putting the channels in the chip, as opposed to in a connected structure in Goodson et al., would increase reliability (e.g., over the arrangement in Goodson et al.). This is clear legal error due to the failure to factually support a legal conclusion.

Second, once the heat exchanger 200 in Goodson et al. has been attached “directly to the surface of the device [50] using thermal attach materials, such as silver-filled epoxy or solders,” they constitute a single component. Putting the channels within the device will not lower the component count to zero. Thus the Examiner’s second contention is clear factual error.

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Because no motivation to combine the references has been shown, a *prima facie* case of obviousness has not been established for claims 19-22, and the rejection thereof should be withdrawn.

Regarding claims 23 and 24, the proposed addition of Crowe, even if such were proper, fails to cure the evidentiary deficiencies noted above. In view of the above, a *prima facie* case of obviousness cannot be established for claims 23 and 24, and the § 103(a) rejection thereof should be withdrawn.

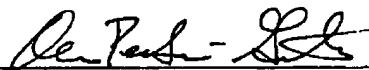
Reconsideration and allowance of claims 1-24 and 27-31 are respectfully requested.

In the event that any outstanding matters remain in this application, Applicants request that the Examiner contact Alan Pedersen-Giles, attorney for Applicants, at the number below to discuss such matters.

To the extent necessary, a petition for an extension of time under 37 C.F.R. § 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-0221 and please credit any excess fees to such deposit account.

Respectfully submitted,

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